

Claims

- [c1] 1.A method for aligning an opaque, active device in a semiconductor structure, the method comprising:
 - forming an opaque layer over an optically transparent layer formed on a lower metallization level, said lower metallization level including one or more alignment marks formed therein; and
 - patterning and opening a portion of said opaque layer corresponding to the location of said one or more alignment marks in said lower metallization level so as to render said one or more alignment marks optically visible; and
 - patterning said opaque layer with respect to said lower metallization level, using said optically visible one or more alignment marks.
- [c2] 2.The method of claim 1, wherein said optically transparent layer comprises a tantalum nitride (TaN) layer.
- [c3] 3.The method of claim 1, further comprising forming a hardmask over said opaque layer.
- [c4] 4.The method of claim 3, wherein said hardmask further comprises a titanium nitride (TiN) layer.

- [c5] 5.The method of claim 1, wherein a photoresist material used to pattern said opaque layer with respect to said lower metallization level is also used to protect said opened portion of said opaque layer corresponding to the location of said one or more alignment marks.
- [c6] 6.The method of claim 1, further comprising forming an oxide hardmask over an exposed portion of said optically transparent layer as a result of said patterning and opening a portion of said opaque layer.
- [c7] 7.The method of claim 1 wherein said one or more alignment marks comprise copper.
- [c8] 8.The method of claim 1, wherein said patterning and opening a portion of said opaque layer is implemented through topographic alignment.
- [c9] 9.A method for aligning a magnetic tunnel junction (MTJ) element in a semiconductor memory array, the method comprising:
 - forming an MTJ stack layer over an optically transparent layer formed on a lower metallization level, said lower metallization level including one or more alignment marks formed therein; and
 - patterning and opening a portion of said MTJ stack layer corresponding to the location of said one or more align-

ment marks in said lower metallization level so as to render said one or more alignment marks optically visible; and

patterning said MTJ stack layer with respect to said lower metallization level, using said optically visible one or more alignment marks.

- [c10] 10. The method of claim 9, wherein said optically transparent layer comprises a tantalum nitride (TaN) layer.
- [c11] 11. The method of claim 9, further comprising forming a hardmask over said MTJ stack layer.
- [c12] 12. The method of claim 11, wherein said hardmask further comprises a titanium nitride (TiN) layer.
- [c13] 13. The method of claim 9, wherein a photoresist material used to pattern said MTJ stack layer with respect to said lower metallization level is also used to protect said opened portion of said MTJ stack layer corresponding to the location of said one or more alignment marks.
- [c14] 14. The method of claim 9, further comprising forming an oxide hardmask over an exposed portion of said optically transparent layer as a result of said patterning and opening a portion of said MTJ stack layer.
- [c15] 15. The method of claim 9, wherein said one or more

alignment marks comprise copper.

- [c16] 16. The method of claim 9, wherein said patterning and opening a portion of said MTJ stack layer is implemented through topographic alignment.